



THE BIGGEST FIND SINCE KING TUT.

## Elusive Neutrinos Captured, Mapped

By Larry O'Hanlon, Discovery News

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**July 22, 2003** — The most elusive particles in the universe are beginning to reveal the locations of the most powerful events ever.

An observatory buried in Antarctic ice called AMANDA II has begun to create a sky map of the most powerful cosmic neutrinos, one of the fundamental particles that make up the universe.

Neutrinos are invisible, uncharged, almost mass-free particles that can pass through stars, planets and humans without leaving a trace.

"Neutrinos can only originate in the highest-energy processes such as in supernova collapse or gamma ray bursts," said Francis Halzen of the University of Wisconsin.

Halzen presented data on the origins of cosmic neutrinos at the ongoing meeting of the International Astronomical Union in Sydney, Australia.

The ability of neutrinos to fly through almost anything is both good and bad for astronomers. On one hand it means that they contain unaltered, fresh clues about the hugely powerful processes that created them. On the other hand, they are awfully hard to detect.

Like other neutrino detectors, the AMANDA II telescope (Antarctic Muon and Neutrino Detector Array), detects neutrinos indirectly. It actually looks downward, through the Earth and into northern skies, using the planet to filter out any other cosmic particles.

Using a network of sensitive light detectors, the apparatus watches for the rare neutrino — maybe ten per year in AMANDA II — that happens to smash dead center into an atom and send out a particle called a muon, which leaves a faint blue trail of light in its wake.

The alignment of the muon trail tells researchers the direction the neutrino was coming from. The muon trail's length reveals the energy the neutrino was packing. The longer the muon trail, the higher the energy and the more powerful the cosmic event that sent the neutrino into space, explained neutrino astronomer John Learned of the University of Hawaii.

But what really makes AMANDA II so promising is not its record on finding the highest-power neutrinos, said Learned. It's that the icy observatory is the going to be expanded into what could be the largest neutrino telescope on the planet, called IceCube, he said.

"IceCube will be a big jump," said Learned, who works on the large 1,000-square-meter SuperKamionde neutrino detector in Japan, which is deep in a mine and uses muon trail detectors submerged on pools of water.

IceCube will cover a million square meters and pick up a lot more neutrinos, he said.

"It's simply a matter of scale," Learned said.



**More Information**

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[< back to original page](#)

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